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Tertium comparationis 8 (2002) 1, S. 44-60

Tertium Comparationis
Journal für Internationale Bildungsforschung
Vol. 8, No. 1, pp.44–60, 2002

TIMS Study, National Findings and Consequences in Cyprus

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Abstract

The public educational system of Cyprus is highly centralized and the Ministry of Education formulates the intended curriculum for all subjects. In general expenditure on all levels of education are satisfactory, although there are demands for more. The University of Cyprus, as a research institution, has a leading role on local and international research projects. The results for students in mathematics and science of the 4th and 8th grade and in the literacy study (TIMSS) in the final year of secondary school are not encouraging for Cyprus. Cyprus was one of the last among the countries that participated in the TIMS study. But the results for students in mathematics who took advanced courses were very encouraging. Only one country had statistically higher achievements than the pupils from Cyprus. In the case of advanced courses in physics, it seems that the students from Cyprus did fairly well. Only four out of 16 countries had statistically higher achievements. The mean achievement of pupils who selected advanced courses is far higher than achievement of the 4th and 8th graders, and the mean achievement of pupils in the literacy courses is far lower than achievement of the 4th and 8th graders. It seems that the Ministry of Education is taking the necessary measures to lift the image of the educational system.

1 The Educational System of Cyprus

The public educational system of Cyprus is highly centralized. The Ministry of Education and Culture is responsible for the enforcement of educational laws and the preparation of new legislation. Public education is financed by the government of Cyprus, while private schools raise their funds primarily from tuition fees. Private schools are administered by private individuals or bodies, but are liable to supervision by the Ministry of Education.

Teachers in public schools are appointed, transferred, promoted, and dismissed by the Educational Service Commission that is an independent five-member body. The Ministry of Education formulates the intended curriculum for all subjects. Syllabi, curricula, and textbooks are prescribed to a large extent by governmental agencies. The education system in Cyprus has four stages: pre-primary, primary, secondary and higher.

1.1 Pre-primary education

The three categories of nursery schools, the public nursery schools, the communal nursery schools, and the private nursery schools, are all under the jurisdiction of the Ministry of Education and Culture. The public nursery schools are established by the Ministry of Education and Culture in collaboration with community authorities and parents' associations. The ministry appoints the teaching staff and subsidizes the equipment. The community authorities and parents' associations have responsibility for the buildings and basic equipment of the nursery schools. The communal nursery schools are established and run by community authorities and parents' associations and are registered by the Ministry of Education and Culture. The ministry contributes with a substantial yearly subsidy. They are staffed by qualified nursery teachers and are supervised by the pre-primary inspectors. The private nursery schools are established and run by individuals with the approval of the Ministry of Education. The nursery schools develop their educational programs according to the officially approved curriculum. During the school year 1997–98 the pre-primary schools in operation were 223 public nursery schools, 113 community nursery schools, and 99 private nursery schools.

1.2 Primary education

According to the Education Acts for Elementary Education, primary school provides six year compulsory schooling to children who complete 5 years and 8 months of age. The next two-year period, children will be entering grade A of the primary school at 6 years of age. Primary education is free and compulsory and officially was introduced in 1962. In reality, primary education has been universal since 1945. Schools function in every town or village when the number of children is more than 15. Communities with less than 15 children are served by neighboring communities. In urban areas and in big rural schools, Cyprus has adopted single-grade classes, while in small communities it has adopted multi-grade classes. At national level, the official pupil-teacher ratio is 18:1. At the end of their six-year schooling, primary school leavers receive a leaving certificate. The main evaluation procedure adopted is the continuous one. No written examination is given at any level. Private primary schools are mainly run by various religious groups on a non-profit basis. They are liable to supervision and inspection by the Ministry of Education and Culture.

1.3 General Secondary Education

Public

The philosophy underlying public secondary education is two-fold: First, the dissemination of knowledge with emphasis on general education and a gradual transition to specialization in order to prepare students for an academic, professional or business career. Second the development of a sound, morally refined personality in order to provide society with competent, democratic and law-abiding citizens. Prescribed subject textbooks corresponding to the syllabi for secondary education are produced by the Curriculum Development Unit.

Public secondary education offers a six-year program of instruction for children at the age of twelve to eighteen. Lower secondary school (gymnasio) caters to pupils aged twelve to fifteen and offers a broad spectrum of general education. A public primary school leaving certificate is required for entrance to the gymnasium. There are no entrance examinations in the public sector of secondary education. Private foreign language primary school leavers must undergo a battery of entrance examinations to enter public secondary schools. Upper secondary school (lykio), open to all pupils who have successfully completed the gymnasium, offers diversity and encompasses three distinct program curricula, all leading to a school leaving certificate. The lyceum offers pupils a three-year program with three categories of subjects which are structured in five streams. All of them include compulsory core subjects, specialization and supplementary subjects. Pupils select one of five tracks upon registration at Lyceum: classical studies, science, economics, commercial, and foreign languages. Transfer procedures in secondary schools are simple and easy. The only exception concerns the upper classes of the Lyceum, where a battery of examinations are required of pupils wishing to transfer from one truck to another.

Assessment in secondary schools is mostly continuous and internal. Repeating the same class in the secondary sector is not very rare. Pupils have to repeat a class if they finally fail in one or more subjects. Continuous assessment in the gymnasium is on a scale of A-E, supplemented by final examinations in June on a 1–20 scale for Greek, mathematics, history and natural science (the last two since 1991–92). Continuous assessment in the lyceum is on a scale of 1–20 and is supplemented by final examinations in Greek, mathematics and the optional subjects in each of the combinations. Since 1990–91, the final examinations in the third and final lyceum class are externally organized.

The academic year commences on 1st September and ends on 30th June. It is divided in three quarter terms (10 Sept. – 10 Dec., 11 Dec. – 10 Mar., 11 Mar. – 31 May). Lessons begin on 10th September and end on 31st May. They run on a five-day week, seven periods of 45' duration per day. The length of the school day is 7:30 a.m. to 1:35 p.m. June is a month for examinations.

Technical and Vocational Education

Secondary technical and vocational education represents about 21% of the total student population of the upper secondary education (15–18 years old). It is offered to students who graduate from the gymnasium at the age of fifteen and have elected to follow either the technical or vocational stream. The main difference between the technical and vocational streams is that in the syllabus of the technical stream more emphasis is given to academic subjects, while in the syllabus of the vocational stream the emphasis is given to technological subjects, workshop practice and industrial training.

Private

A number of private secondary establishments ranging form missionary boarding schools to vocationally oriented institutions and foreign language centers offer tuition in specialized fields. Funded by overseas organizations and/or religious denominations and local entrepreneurs, private secondary schools offer students the opportunity to pursue qualifications that would ensure their admission to overseas universities or local

tertiary education establishments, and to their transition into the professional sphere or the business world. Although private secondary schools are independent in their operation and curricula, the majority of them is registered with the Ministry of Education and Culture and complies with certain curriculum and facility requirements mandated by law. Curriculum programs for most private secondary schools extend over a six-year period with emphasis on general education for the first three years. Foreign language schools have six- or seven-year curriculum programs with English, French, Italian or Arabic as the basic languages of instruction.

1.4 Special Education

According to the 47/79 Law for Special Education, the Cyprus government has undertaken responsibility for the education of children with special needs between the ages of 5 and 18. The government policy is to encourage and support the integration of children with special needs into the ordinary educational system and provides them with the opportunity to grow and learn together with their "non-handicapped" peers. In the case of children with more severe needs, their local and social integration is supported by extra educational help offered by special or support teachers assigned to ordinary schools. Pre-school hearing impaired and autistic children are also partially integrated through their placement in special units attached to kindergartens and primary schools and part-time attendance of the ordinary class program. A total of 1.100 children attend individual programs in regular schools offered by 100 special educators. On the other hand 258 students attend programs in special schools offered by 80 special teachers.

1.5 Higher and Tertiary Education

Higher education is provided by public institutions and private third level institutions that award diplomas below first university degree level. The University of Cyprus started its operation in September 1992 and is now in its ninth year of operation with about 2.000 students. About 63% of all secondary school leavers continue their studies beyond secondary level. Of these, about 36% attend higher education institutions in Cyprus and the remaining 27% attend higher education institutions abroad. During the academic year 1996–97 there were 9.813 Cypriot students at tertiary institutions abroad distributed by country as follows: Greece 43%, U.K. 28%, U.S.A. 19%, other countries 10%. During the academic year 1996–97 there were 9 public and 20 private institutions of higher education in Cyprus, with a total of 9.982 students, including 1.675 (19%) overseas students. Students at tertiary education institutions are distributed as 50% to public institutions and 50% to private institutions. Foreign students in Cyprus mainly come from countries of the British Commonwealth and the Middle East.

The University of Cyprus currently offers programs through the following faculties and departments, Faculty of Humanities and Social Sciences, Faculty of Pure and Applied Science, Faculty of Economics and Management, Faculty of Letters. During the academic year 1996–97 the total number of students was 2.097 with about 10% foreign students.

The eight public tertiary institutions offer courses at the sub-degree level in various fields of study. The public institutions are: The Cyprus Forestry College of the Ministry of Agriculture and Natural Resources, the Higher Technical Institute (H.T.I.) of the Ministry of Labor and Social Insurance, the Higher Hotel Institute of the Ministry of Labor and Social Insurance, the School of Nursing of the Ministry of Health, the Mediterranean Institute of Management (M.I.M.) of the Ministry of Labor and Social Insurance, the Public Health Inspectors School, the Tourist Guides School, and the Cyprus Police Academy. A number of private tertiary institutions offer programs in various fields of study (e.g. secretarial studies, business administration, electrical, civil and mechanical engineering, hotel and catering, banking, accountancy and computer studies), with duration of one to four years. According to the law 67(I)/96, all private tertiary institutions have to register with the Ministry of Education and Culture. Twenty tertiary education institutions are registered with the ministry and offer specific courses leading to the award of a certificate/diploma/degree.

1.6 In-Service Training

The in-service training of primary, secondary general and technical schoolteachers is the task of the Pedagogical Institute. For this purpose the Institute organizes optional as well as compulsory seminars. The Pedagogical Institute is by its very nature a developmental institution and in order to fulfill this function, it also deals with educational research and evaluation, educational technology, and educational documentation. From time to time, scholars from the U.S.A., the U.K., Germany, France and Greece are assigned to teach at the Institute in the framework of bilateral cooperation and exchange programs between the Cyprus government and institutions abroad. Also, local staff with expertise in various areas is periodically asked to teach at the Pedagogical Institute.

1.7 Statistical Data for 1996/97

At all levels of education, there were 1.207 schools, 162.498 full-time pupils/students and 12.275 teachers (full-time equivalent) giving a pupil/teacher ratio of 13,2. Of the total pupils/students, 81,0% was enrolled in public schools and 19,0% in private schools. The enrolment of pupils/students by level of education was as follows: pre-primary 25.996, primary 64.761, secondary 61.266, tertiary 9.982 and special education 493. Another 98.784 pupils/trainees were in part-time institutes and other non-formal education. Cypriot students abroad totaled 9.813 (excluding those students not registered with the Ministry of Education for obtaining foreign exchange for their studies) during the academic year 1996/97. Their distribution by level of education was as follows: Under-graduate 6.785 or 69,0%, post-graduate 1.238 or 12,0%, non-university higher 999 or 10,0%, vocational 321 or 3,3% and preparatory 466 or 4,5%. The most popular fields of studies were: commercial and business administration, engineering/technology, medicine, social sciences, humanities, fine arts, mathematics and computer science.

Expenditure on all levels of education, both public and private stood for the year 1995/96 at CP 259,2 million of which public expenditure amounted to CP 177,8 million and accounted for 13,5% of the country's budget and 4,5% of the gross national

product. The cost per pupil/student by level of education for the year 95/96 was as follows: pre-primary CP 523, primary CP 819, secondary CP 1.580, third level CP 2.182, special education CP 4.441. (ICP = $2)

2 Educational Research in Cyprus

In order to understand educational research in Cyprus it is necessary to see a brief historical perspective of the establishment of Units related to educational research. The establishment of the first "Educational Research Unit" was a matter of accident (Papaioannou 1980). In 1963, three years after the independence, a psychologist who was appointed at the Department of Education of the Greek Communal Chamber in the Republic of Cyprus, in the definition of his duties he suggested the inclusion of educational research. Although there was no intention by the official side to introduce research in that time, it was agreed that he could undertake research projects, in addition to his other duties as a psychologist.

As a second progress to this direction, the UNESCO report by Wedell (1971) suggested to the government of the Republic of Cyprus the establishment of the Cyprus Pedagogical Institute, which would have four departments, one of which was the Department of Educational Research. Some of the suggestions made for this department were among others that teachers should undertake educational projects during their in-service training and all academic staff of the Institute should have the duty to pursue and supervise research. As we can see educational research does not have a long history in Cyprus. In the period between 1963–1973 educational research was initiated either by the Research Unit of the Ministry of Education or by individuals, especially those who were studying in universities abroad.

During the period between 1973 and 1992, before the establishment of the University of Cyprus, the Pedagogical Institute established connections with international research organizations like the International Association for the Evaluation of Educational Achievement (IEA), the National Foundation for Educational Research (NFER) and with individual universities like the University of Heidelberg, the University of Maryland, and the Toledo University.

The research projects that the Department of Educational Research curried out may be grouped in two main categories. The first category includes those projects that have a comparative dimension and concern the participation of Cyprus with other foreign countries. The second category is confined to those projects referring to topics reflecting the needs of the Ministry of Education. Some of the projects that fall in the first category are, the IEA reading literacy study, the IEA Third International Mathematics and Science Study (TIMSS), the Evaluation of Mathematical, Language and Science knowledge using the APU model, the achievements of the sixth grade Greek Cypriot and American pupils with regard to mathematics computation and problem solving abilities, the teachers' perceptions of mathematics and mathematics learning in an international comparative context.

The budget for all research projects undertaken by the Department of Educational Research comes from the government. This includes the salaries as well as the expenses related to special facilities, stationary, traveling, and secretarial assistance. The whole system of the budget works in the following way. Every member of the

Pedagogical Institute gives estimates about the yearly budget for each project he is responsible based on the yearly plans and in the framework of the 5-year plan of the Institute. Details for each project are discussed in a meeting of the head of the Department of Educational Research and the director of the Pedagogical Institute in which the first approval is made.

A proposal is send to the Ministry of Education for a second step of approval. Almost in all cases the Ministry of Education accepts the proposals made by the Pedagogical Institute. The third step of approval comes from the Planning Bureau that asks for details on every aspect of the project. At this level some cuts may be made but not big enough to drastically change the original plans of the research projects. In the case, in which for some reasons the department runs out of money for a specific project it asks for additional funds which is given after the documentation of the expenses is convincingly presented.

As is mentioned above, the Pedagogical Institute is a governmental institution and as such has the flexibility to arrange visits to all primary and secondary schools without having to ask for prior permission from the Ministry of Education. The Pedagogical Institute, certainly, does inform the Ministry of Education about all the activities that it undertakes. Within this framework there are instances when primary school head-masters have been utilized after some brief training in giving out various tests and questionnaires in schools other than their own.

There has never been any negative reaction to any of the research projects conducted so far by the teachers' unions. In fact, one of them is financially sponsoring the international IEA research projects on an annual basis. The teachers are always keen to co-operate and a substantial majority of them answer, without any reward, the questionnaires sent to them. Moreover, in no case permission is asked from the pupils or their parents to answer questionnaires or tests used in educational research. In some cases, such as in the international research projects, under the auspices of IEA, the participating pupils even write their names on the document responded to, which here in Cyprus is considered to be a form of pressure on the pupils to try harder to answer questions truthfully, especially those questions relevant to school achievement.

After the establishment of the University of Cyprus in 1992, all the IEA research projects have been undertaken by the Department of Educational. Whenever the University of Cyprus undertakes any educational research, it has to ask the Ministry of Education and Culture for permission to approach state schools. Such permission has invariably been given, although after the publication of the TIMSS results, which Cyprus was ranked below the average, there seems to be some reluctance in granting this permission. The research projects undertaken by the University of Cyprus within the IEA framework are CIVICS, SITES, TIMSS and Reading Literacy. Financial sponsoring comes from either the University of Cyprus or by external agents.

3 Conduction of Study

The IEA organization's highest governing body, the General Assembly, comprises one representative from each member country (or educational system). The General Assembly Representative, who is the first to know about the initiation of a new research project, contacts the various institutions in his country that have the necessary specialized personnel, the financial capability and the necessary infrastructure whether they would be willing to undertake the research proclaimed by the IEA. When the existence of such willingness has been established, the research is formally assigned to that particular institution. For example, after the proclamation of the TIMSS-R research, letters were sent to the Minister of Education and Culture, the Pedagogical Institute, which is part of the Ministry, and the Department of Education of the University of Cyprus asking them to undertake the research jointly as it was an expensive one. The Ministry of Education and Culture and the Pedagogical Institute refused to participate while the Department of Education of the University of Cyprus agreed to undertake the study. It is thus made clear that in Cyprus there is no predetermined method of selection of the institution to which an IEA research will be assigned. Regarding the financial side of the cost of the project, this is left to the institution selected and its sources of funds. In the case a research is assigned to an institution under the control of the Ministry of Education and Culture, the Government of Cyprus covers the research costs. In the case the research is assigned to the University of Cyprus, funding is the responsibility of the university out of its own funds or with financial assistance from private organizations, such as banks or associations, such as the Teachers' Unions.

3.1 National sample

Cyprus is a small country and the number of schools is consequently limited. This small number makes sampling easier due to the fact that the total school population is always used. Only in the case of primary education random sampling is employed. In the case of the TIMSS research, both in the gymnasiums and the lyceums, all schools were selected. Population 1 consisted of students in the two adjacent grade levels that contained the most nine-year-olds. Population 2 consisted of students in the two adjacent grade levels in each country that contained the most thirteen-year-olds. Population 3 consisted of students in their final year of secondary school. For Population 3, all 29 Greek secondary schools were included for the within school sampling. Population 3 is divided into two sub-samples: those pupils who had selected the *track 2 (S2)*, i.e. the students opting for advanced mathematics and science and the rest, who had opted for classics, sciences was included also, economics, commercial, foreign languages and vocational tracks. For the first group the whole student population was taken, while for the second group 10% of the population was taken as per the instructions given by the International Coordinating Center. From the total school population the pupils attending private foreign language schools and the vocational section of the technical schools were not considered.

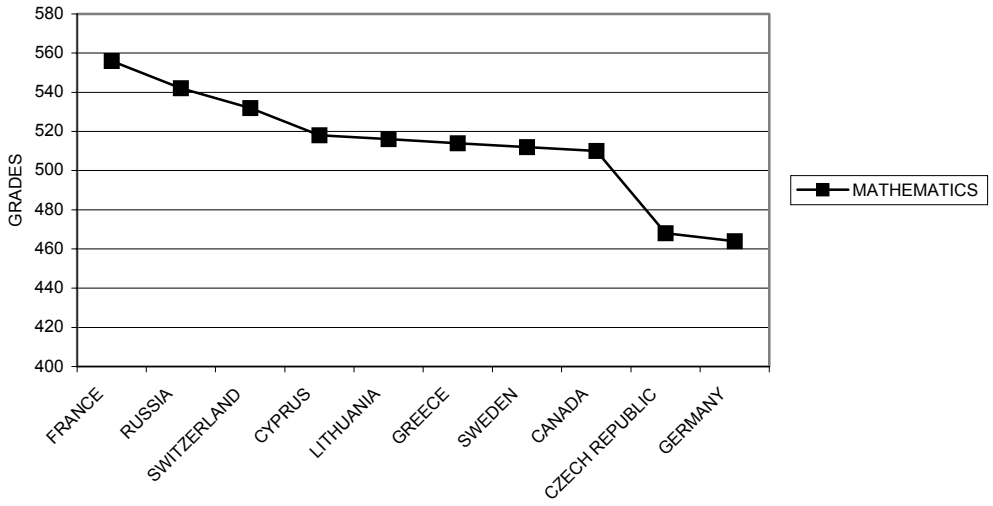
4 Findings

Cyprus is one of the few countries that took part in all three populations in the TIMSS project. In Population 3, Cyprus participated in both the literacy part and the advanced mathematics and science part. The pictures that emerge in each of these two categories are very different. In the case of literacy, Cyprus was among the last countries, whereas in advanced mathematics and science it was among the leaders. The test on the mathematics and science literacy was designed to measure the mathematics and science learning of all the final year students regardless of their particular school curricula. The mathematics and science literacy study is intended to provide information about how prepared all the school leavers in each country are to apply their knowledge in mathematics and science to meet the challenges of life beyond school. The results of mathematics and science literacy are not encouraging. Among the 21 countries participating in this part of the study, Cyprus ($\overline{X}$=447, se=2.5) was among the last countries. More specifically, Cyprus was the 20th, but its average was statistically equivalent to that of Lithuania and the Czech Republic. The country that follows Cyprus is South Africa. Statistically, the differences in mathematics and science literacy achievement by gender for the final-year students significantly favored males ($\overline{X}$=456) rather than females ($\overline{X}$=439). A comparison of mean achievement separately for mathematics and science shows that in the case of Cyprus the difference remains the same; that is, Cyprus is near the bottom. To provide an educational context for interpreting the results for mathematics and science literacy, TIMSS collected descriptive information from students about their backgrounds as well as their activities in and out of school.

4.1 Mean achievement in advanced mathematics by country

Sixteen countries in all participated in the part of the research relating to pupils who had selected advanced mathematics and science. In figure 1, the six countries, Australia, Austria, Italy, USA, Denmark, Slovenia, not satisfying guidelines for sample participation rates and unapproved sampling procedures and low participation rates were excluded.

Figure 1: Mean achievement in advanced mathematics by country

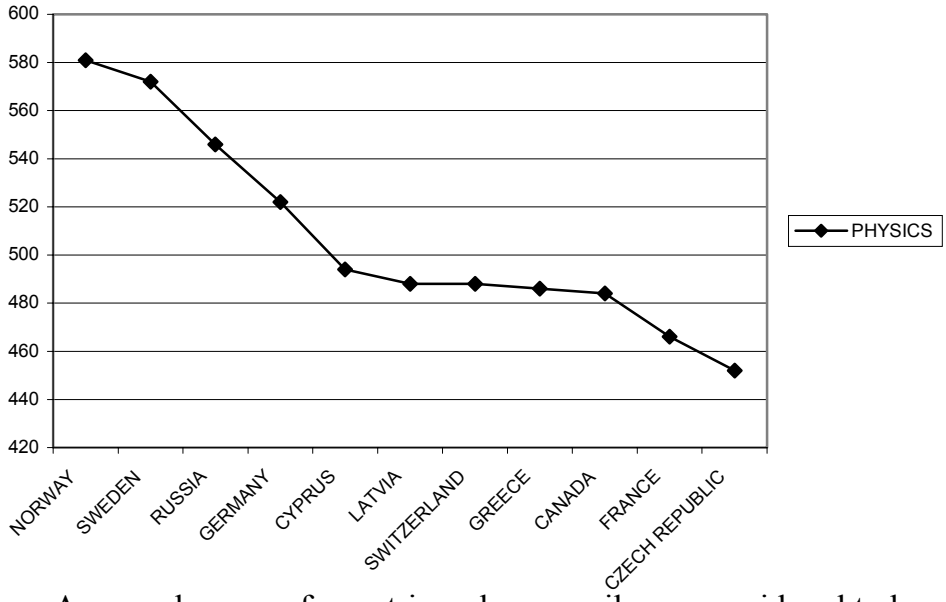


The definition of advanced mathematics courses was left to each country and therefore varied. However, as a point of reference, the students involved had taken calculus, trigonometry, higher-level algebra or geometry, or other advanced mathematics courses. The test questions primarily covered the content areas of equations and functions, calculus and geometry. The results of Cyprus in mathematics were very encouraging ($\overline{X}$=518, se=4,3). Only the students from France had statistically higher achievements than the pupils from Cyprus. Cyprus statistically is equivalent to Russia, Switzerland, Australia, Denmark, Lithuania, Greece, Sweden and Canada. The pupils from Cyprus achieved higher than their counterparts from Slovenia, Italy, the Czech Republic, Germany, USA and Austria. The results indicate that a larger number of boys than girls selected the advanced mathematics combination, and the difference in achievement (15 points) is not statistically significant.

4.2 Mean achievement in physics by country

Also, in the case of physics, it seems that the students from Cyprus did fairly well. The countries whose pupils did better than Cyprus were Norway, Russia, Sweden and Denmark.

Figure 2: Mean achievement in physics by country

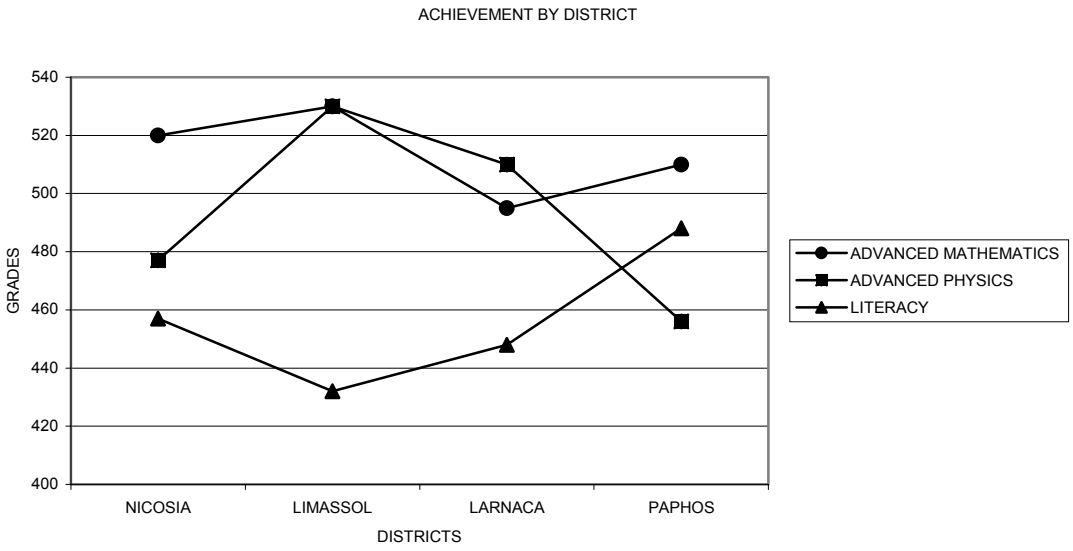


A second group of countries whose pupils are considered to be on the same level as the Cypriot students are Slovenia, Germany, Australia, Switzerland, Latvia, Greece, and Canada. The last group of countries with the lowest achievement comprises France, the Czech Republic, Austria and the USA. As in figure 1, in figure 2 five countries, Australia, Austria, USA, Denmark, Slovenia, not satisfying guidelines for sample participation rates and unapproved sampling procedures and low participation rates were excluded.

4.3 Mean achievement by district

The results that emerged in the four districts are worth looking on to. Researches so far have tended to indicate that in both the Primary school and the Gymnasium, i.e. up to the age of 15, the district of Nicosia pupils were always consistently ahead of all the others. In the case of the TIMSS results of the 12^{th} grade the tendency seems to be different. As indicated in figure 3, the pupils in the district of Limassol have the highest mean achievements both in advanced mathematics and in advanced physics. On the other hand, the pupils of this district who did not select advanced courses but common core mathematics and physics had the lowest mean achievements in comparison with the other districts. The mean achievement of the pupils in the Paphos District is also worth commenting on. Whereas the advanced mathematics students did fairly well, this does not seem to hold in the case of advanced physics, in which the position in the hierarchical order was last. On the other hand the pupils' mean achievement in the common core subjects was the highest compared with those of all the other districts.

Figure 3: Mean achievement by district seems to be different.



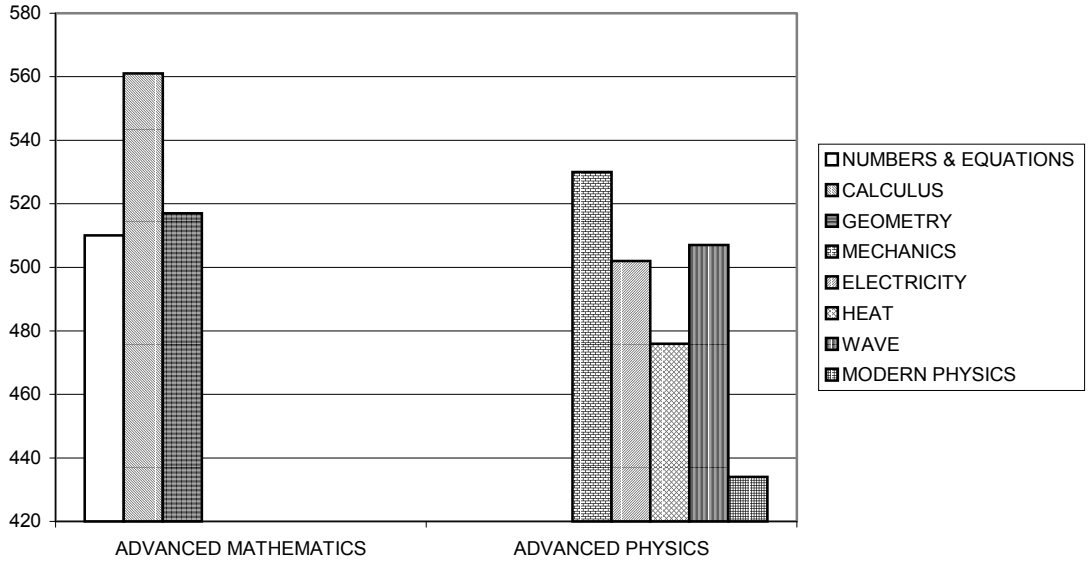
4.4 Mean achievement by content areas

Another interesting comparison that has to be studied concerns the fluctuation of the pupils' achievements according to the emphasis given in our educational system to the various teaching units, in both mathematics and physics. Figure 4 indicates that in the case of advanced mathematics, the pupils of Cyprus had the highest achievement in calculus ($\overline{X}$=561) followed by geometry ($\overline{X}$=517) while in third place we find the unit of numbers and equations ($\overline{X}$=510). Looking at these mean achievements and comparing them with the respective emphasis in the mathematics curriculum, we find that there is a direct correspondence; that is, the greatest emphasis in the curriculum is given to calculus, while less emphasis is given to the units of geometry and numbers and equations. As a consequence, in order that the comparison between the countries is made more objective in mathematics, it has to be accompanied by the respective

emphases given for each teaching unit in the curriculum. The picture that emerges in advanced physics for each teaching unit is mechanics ($\overline{X}$ = 530), wave ($\overline{X}$=507), electricity ($\overline{X}$ = 502), heat ($\overline{X}$=476) and modern physics ($\overline{X}$=434).

The emphasis given to the teaching units in physics of the 12th grade corresponds also to the ranking above; i.e., the highest emphasis in the curriculum is given to gechanics (34,7%), wave (25,3%), electricity (20,6%) and modern physics (19,4%). The unit heat is actually not taught in the 12th grade. One, however, has to bear in mind that the emphases in the 11th grade differ from those in the 12th grade. In general, it is expected that pupils carry over their knowledge from grade to grade.

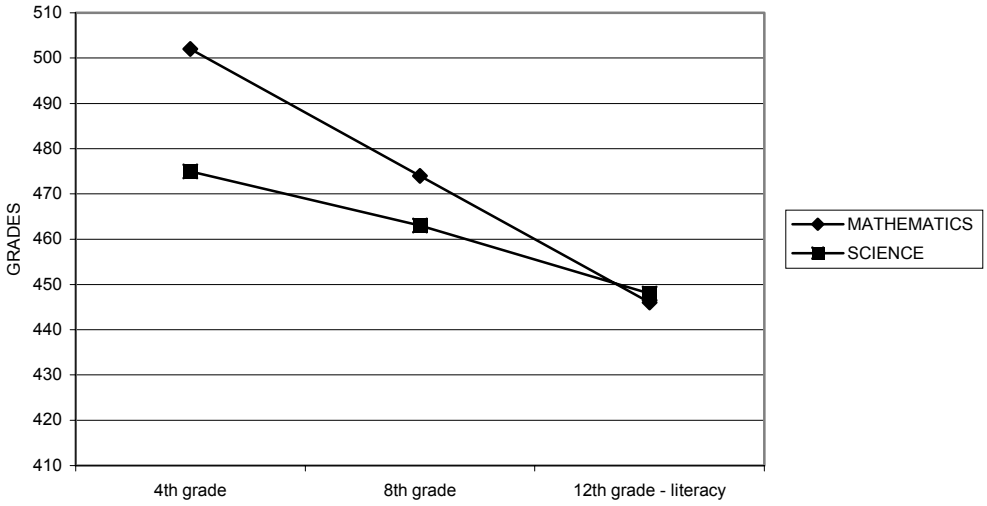
Figure 4: Mean achievement by content areas



5 Patterns of Achievements

With the release of the results for students in their final year of secondary school (Mullis et al. 1997) attention is turning to understanding the patterns of achievements for the various student populations. It is reasonable to conclude that the attainments of these earlier populations should have some predictive value for the mathematics and science literacy scores. The mathematics and science attainments are likely to be representative of the prior common attainments of those taking the literacy test. However, they are separated from the literacy testing by four to eight additional years of mathematics and science study, schooling and maturation (McKnight & Valverde 1999). The scores for each of the three tests were again independently scaled and had varying means. Further, the six tests also had somewhat differing standard deviations. With those caveats in mind, the results are presented in figures 5 and 6.

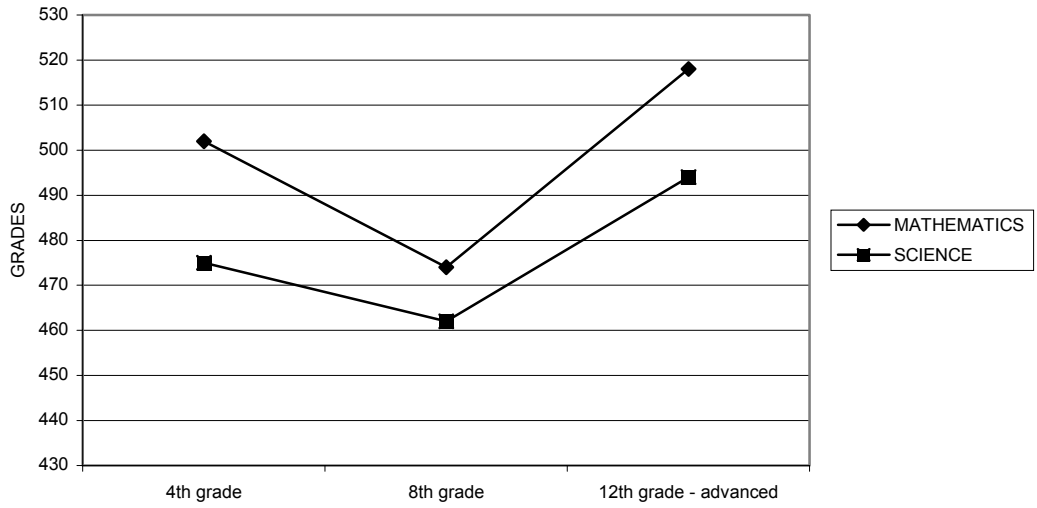
Figure 5: Patterns of achievements – Literacy



It is evident from figure 5 that the mean achievement of the primary school pupils was higher than the mean achievement of the gymnasium pupils, and the mean achievement of grade 8 pupils was lower than the mean achievement of the 12 grade pupils in literacy. This is something that the Ministry of Educational officials should take very seriously, if they want to improve the educational system of Cyprus.

The picture in figure 6 is different. The mean achievement of the pupils who selected advanced mathematics and advanced physics is far higher than the achievement of the 4th and 8th grade pupils. This can be easily interpreted by someone with knowledge of the educational system of Cyprus. The pupils who in grade 10 select the advanced mathematics and science combination tend to be the highest achievers, not only in the above two subjects but also in all the other subjects taught at school.

Figure 6: Trends achievement – advanced courses



A relevant question is whether high achievement yields for specialist students are

associated with high achievement yields for the general population of those finishing secondary school. Specialist students in mathematics, as shown above, were tested on calculus, functions, advanced algebra and geometry, and aspects of the real number system. Specialist students in physics were tested on mechanics, electricity and magnetism, heat, wave phenomena, and modern physics: particle, quantum and astro-physics, and relativity (Mullis et al. 1997). General students, including a proportion of specialists, were tested on basic mathematics and science literacy, and general knowledge.

The relations of these three sets of results are important both for those responsible for mathematics and science education policy and research. Each represents a kind of mathematics and science attainment "yield" of educational systems (McKnight & Valverde 1999). It is known that the results of the last year of secondary school followed the results of Population 1 and Population 2 (Beaton, Mullis et al. 1996; Beaton, Martin et al. 1996; Martin et al. 1997; Mullis et al. 1997).

6 Reception of international achievement comparisons in Cyprus

The announcement of the TIMSS research results was a shock for Cypriot society and the Ministry of Education and Culture. All the newspapers, radio stations and television channels had the results of this research as the first item of news. There followed many discussions and debates on both radio and television concerning the reasons for the failure of the students of Cyprus. The House of Representatives invited the TIMSS National Research Coordinator to three of its sittings in order that he would present the results to the House Standing Committee for Education.

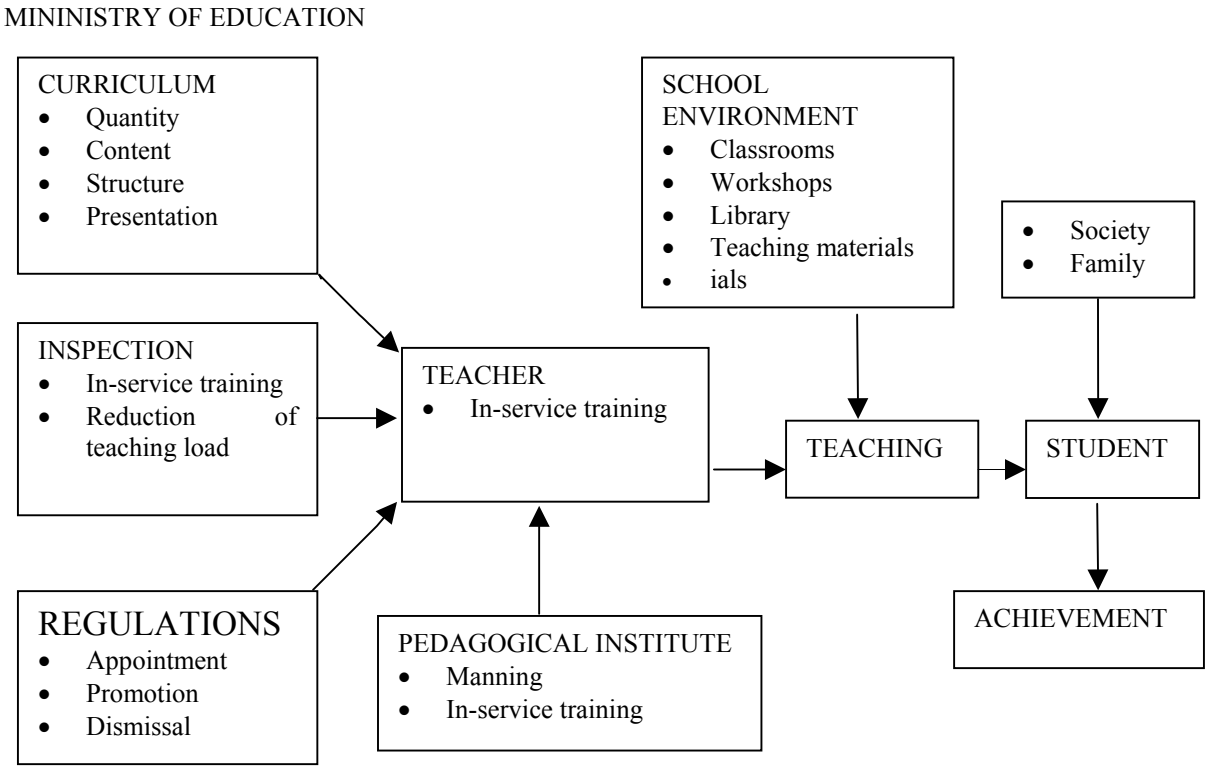
Some of the newspaper reports are also of special interest. "Disappointing Results for the Cypriot Pupils" (Machi, Tuesday 9/12/97). "The announcement of the TIMSS research results has caused a shock and given rise to intense discussion" (Minas 1997). "Cyprus fails to pass in mathematics and science" (Alithia 1996). "Crash landing for the education level of Cyprus would be an apt description of the results of an international research in mathematics and science" (Chrysanthou 1996). "In final analysis, the prevalent impression that the levels of our schools can be favorably compared to those of the advanced countries is a fake, since reality indicates otherwise" (Demetrakopoulou 1996). "Cyprus at the bottom of the league table in the broadest ever international research on mathematics and science" (Antonopoulou 1996) "A shock for our education system from the announcement of the results of a research conducted by an international organization on a global basis, since the results leave the pupils of Cyprus at the bottom of the achievement table in Mathematics and Science" (Papastylianou 1996). "Shock to the foundations of our education emanates from the difference in achievement between pupils in urban and rural areas" (Apogevmatini 1996). "The Ministry of Education and Culture launched a frantic effort to find excuses for the desperately low achievement of the pupils from Cyprus. The credibility of the research was questioned although it was the work of an international organization. Groundless arguments were put forth that in our educational system mathematics is not a primary school subject, that our pupils are not used to multiple choice questions, that our pupils were younger, that our pupils do not take such research seriously" (Minas

1997). “On the other hand, the National Research Coordinator defended the validity of the research and presented a theoretical framework of changes that are necessary to be made in order that the educational system of Cyprus be improved. Some of the aspects mentioned concern changes in the curriculum, the teachers’ appointment system, the teaching load of the teachers and their in-service training” (Papastylianou 1996).

The idea, proposed by certain circles in the Ministry of Education and Culture, that Cyprus ought to have withdrawn from the international test for Mathematics and Science in good time before it sank to the bottom is an indication of a mentality that is not conducive towards a confrontation with the serious, proven problems emerging from the research. This is nothing but the naïve attitude that a problem does not exist if you do not see it. Yet, the problem will not go away (O Filelefθeros 1997). The TIMSS research poses questions and drops a big stone into the apparently calm waters of Cypriot education. It has been known but never openly admitted that Cypriot education is ill.

TIMSS has made us stand in front of our responsibilities and ask ourselves what we have to do in order to improve the sad image of our education. It is, however, a paradox that the pupils of Cyprus, almost in their totality, claim that they believe that they are good at Mathematics. This positive self-image, juxtaposed to the low results, amounts to a tragic delusion, or even a kind of national tendency to hide our heads in the sands of self-deception (Kyza 1997). The discussion of the issue of the pupils’ results before the House of Representatives Standing Committee on Education developed into an open conflict between the University of Cyprus and the Ministry of Education and Culture. Professor Andreas Demetriou commented that the results had actually come as no surprise in view of the fact that our educational system lags about 30 years behind. In our teacher-centered system, as mentioned in the UNESCO Report on Education in Cyprus, the teacher talks without making an effort to directly involve the pupil, according to each one’s abilities (Papastylianou 1997).

Figure 7: Framework for changes in the educational system



7 Consequences of the Study

Hard on the heels of the announcement of the results of the TIMSS research and the subsequent tumult, the Ministry of Education and Culture received the UNESCO Report, which assesses the educational system of Cyprus. The issues proposed to the Ministry of Education and Culture by the two reports largely coincide. The Ministry of Education and Culture has set up committees to study the various aspects of the report and to make suggestions as to the measures to be taken aiming at the realization of their proposals, such as financial expense, setting up mechanisms to achieve the targets, time schedules, etc. At the end of the day, it seems that there exists a willingness to take all the necessary measures to lift the image of the educational system of Cyprus out of what the TIMSS research results show to be low levels of achievement in mathematics and science and which finds the UNESCO Report in total agreement.

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